

## Section 924— Miscellaneous Electrical Materials

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### 924.1 General Description

This section includes the requirements for the following miscellaneous electrical materials:

- Ground rods
- Fuses and fuse holders
- Lightning arresters
- Circuit breakers
- Disconnect switches
- Photoelectric controls
- Magnetic contactors

#### 924.1.01 Related References

##### A. Standard Specifications

General Provisions 101 through 150.

##### B. Referenced Documents

ASTM A 153/A 153M

EI/NEMA publications

### 924.2 Materials

Ensure that all electrical materials are approved by the Underwriter's Laboratory or other acceptable testing agency.

#### 924.2.01 Ground Rods

##### A. Requirements

1. Use ground rods that are 5/8 in,  $\pm$  1/16 in (16 mm,  $\pm$  2 mm) diameter and 8 ft (2.4 m) long, unless otherwise shown on the Plans.
2. Ensure that the rods are galvanized steel with a minimum coating of 2 oz/ft<sup>2</sup> (610 g/m<sup>2</sup>) according to ASTM A 153/A 153M.

##### B. Fabrication

General Provisions 101 through 150.

##### C. Acceptance

General Provisions 101 through 150.

##### D. Materials Warranty

General Provisions 101 through 150.

#### 924.2.02 Fuses and Fuse Holders

##### A. Requirements

Use fuses of the amperage indicated on the Plans and with an appropriate voltage rating to operate at the voltage specified on the Plans.

##### B. Fabrication

1. Use in-the-line, waterproof fuse holders.
  - a. Construct and install the fuse holder so it will retain the fuse on the load side if disconnected or broken apart.
  - b. Install the fuse holder with a breakaway feature, when specified on the Plans.
2. Install a weatherproof boot, furnished by the fuse holder manufacturer, over each end of the fuse holder.

##### C. Acceptance

General Provisions 101 through 150.

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### D. Materials Warranty

General Provisions 101 through 150.

#### 924.2.03 Lightning Arresters

##### A. Requirements

Use lightning arresters of the metal oxide varistor type, rated at 650 volts, and have the number of poles required, unless otherwise specified.

Provide a pole for each ungrounded leg of the service voltage.

##### B. Fabrication

1. For units not sealed at the factory:
  - a. Apply silicone caulk to the lead entrance.
  - b. Install heat shrinkable tubing, with precoated sealant on the interior surface, over the lead entrance.
2. Place the arrester in a watertight housing. Ensure that the lead entrance to the housing is encapsulated or sealed.

##### C. Acceptance

General Provisions 101 through 150.

### D. Materials Warranty

General Provisions 101 through 150.

#### 924.2.04 Circuit Breakers

##### A. Requirements

1. Use circuit breakers that have the following characteristics:
  - Are thermal magnetic, molded case, quick-make and quick-break
  - Operate with over-the-center toggles with the handle going to a position between “ON” and “OFF” to indicate automatic tripping
  - Can bolt on with an industrial rating and a minimum interrupting capacity of 10,000 RMS symmetrical amperes
  - Be enclosed in a lockable, weatherproof enclosure
  - Have proper lugs that are sized for the cable used. Do not cut cable strands to attach to circuit breakers.
2. Use multi-pole breakers that are of the single handle and common trip type with a voltage rating of at least 240 volts from line to ground.

##### B. Fabrication

General Provisions 101 through 150.

##### C. Acceptance

General Provisions 101 through 150.

### D. Materials Warranty

General Provisions 101 through 150.

#### 924.2.05 Disconnect Switches

##### A. Requirements

1. Use disconnect switches with the voltage and ampere rating specified on the Plans.
2. Fuse the switches as designated on the Plans.
3. Use switches that are 2-pole, 3-wire, solid neutral with heavy duty rating, unless otherwise specified.  
You may install the switch separately or with a magnetic contactor.
4. Enclose the switch in a lockable, stainless steel, weatherproof enclosure.
5. Use the proper lug sized for the cable used. Do not cut cable strands to attach to disconnect switches.

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### B. Fabrication

General Provisions 101 through 150.

### C. Acceptance

General Provisions 101 through 150.

### D. Materials Warranty

General Provisions 101 through 150.

## 924.2.06 Photoelectric Controls

### A. Requirements

1. Use photoelectric controls that have the following characteristics:
  - Have a factory setting for turn-on at 1.5 footcandles (16 lux) ambient light level
  - Have a suitable differential between turn-on and turn-off levels to prevent cycling at critical levels
  - Operate on a supply voltage of 105-130 volts, 50/60 Hz AC, with an inrush rating of 120 amperes at 120 volts
  - Operate with a lamp load rating of 1,000 watts for incandescent and 1,800 volt-amperes for mercury vapor and fluorescent lamps
  - Contain built-in surge and lightning protection
  - Have a rated life at full load of at least 5,000 on-off operations
  - Have relay contacts that are single-pole, single-throw (SPST), normally closed (NC)
  - Have dielectric strength of at least 5,000 volts between any current carrying part and metal mounting surface
  - Withstand an ambient temperature range of -65° to 158° F (-54° to 70° C)
  - Have a moistureproof housing about 2-1/4 in (60 mm) high with a base diameter of less than 3-1/4 in (85 mm)
  - Have a chassis of molded phenolic with three locking-type blades and a neoprene gasket that meet EEI/NEMA publications
2. Provide an approved receptacle for mounting the photoelectric control.

### B. Fabrication

General Provisions 101 through 150.

### C. Acceptance

General Provisions 101 through 150.

### D. Materials Warranty

General Provisions 101 through 150.

## 924.2.07 Magnetic Contactors

### A. Requirements

1. Use magnetic contactors that have the following characteristics:
  - Have the voltage and ampere rating as specified on the Plans
  - Have the number of poles required to open each ungrounded conductor
  - Have a coil voltage of 120 volts, 60 Hz AC, unless otherwise specified
  - Are in lockable, stainless steel, weatherproof enclosures, unless otherwise specified
  - Have proper lugs sized for the cable used
2. Do not cut cable strands to attach to contactors.

### B. Fabrication

General Provisions 101 through 150.

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### **C. Acceptance**

General Provisions 101 through 150.

### **D. Materials Warranty**

General Provisions 101 through 150.